Laparoscopic Ovarian Cystectomy

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Abstract

Laparoscopy has enabled the laparoscopic gynecologic surgeon to manage many gynecologic surgical challenges in a minimally invasive manner. The laparoscopic approach has become the gold standard in the surgical management of ovarian cysts due to innovative changes in surgical instrumentation and the development of new surgical techniques. Benign ovarian cysts such as persistent and symptomatic functional ovarian cysts, corpus luteum cysts, and cystic ovarian neoplasms such as endometriomas or mature cystic teratomas are now managed as an outpatient procedure decreasing cost and recovery time to the patient. Pelvic ultrasound is the most useful imaging tool in the evaluation of an ovarian cyst. Complex ovarian cysts should be considered for removal in the symptomatic premenopausal woman and in all postmenopausal women. The decision to intervene surgically may be complicated and should be individualized for each patient. Aspiration of ovarian cysts is associated with a high rate of recurrence; therefore, cystectomy is the procedure of choice. Ovarian conservation is preferred in the premenopausal woman if at all feasible, and laparoscopic salpingo-oophorectomy is usually the procedure of choice for the postmenopausal woman.

Laparoscopic entry into the abdomen requires a detailed understanding of the vasculature of the anterior abdominal wall. Techniques may need to be altered depending on a patient's BMI (body mass index), past history of abdominal surgeries, and history of bowel obstruction or hernias. Laparoscopic removal of the ovarian cyst should facilitate intact removal and avoid intraoperative spillage.

Keywords

Laparoscopic • Ovarian • Cystectomy • Functional cyst • Endometrioma • Dermoid • Complex cyst • Simple cyst • Port placement

Contents

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1 Introduction

Laparoscopy has become a standard surgical approach for many gynecologic procedures in the last 40 years. It has now become the standard treatment of choice for surgical management of ectopic pregnancies and persistent and/or symptomatic adnexal masses and diagnosis and surgical treatment of endometriosis. The laparoscopic surgical approach has also enabled surgeons to offer minimally invasive hysterectomies.

When laparoscopy was initially utilized in gynecologic surgery, it was limited to diagnostic procedures and tubal ligations. The repertoire of the laparoscopic approach has evolved in the last 20 years as a result of the development of new innovations involving more advanced equipment, improved imaging with new camera systems, and improved expertise in surgical technique. In recent years, newer surgical approaches have developed. In particular, robotic-assisted laparoscopy and, very recently, single-port laparoscopy are gaining more popularity with laparoscopic surgeons. As with the development of any new procedures, the actual roles of these procedures in gynecologic surgery are controversial, and their role remains to be well defined.

Scientific data has consistently supported the laparoscopic approach to the adnexal mass as the preferred treatment. It has been estimated that approximately 10% of women in the United States will undergo a surgical procedure for an adnexal mass in their lifetime (Hilger et al. 2006). Laparoscopy has also been consistently shown to be associated with decreased postoperative complications such as fever, infection, postoperative pain, and blood loss. Decreased length of hospitalization and overall cost offer additional advantages compared to laparotomy (Yuen et al. 1997; Fanfani et al. 2004; Medeiros et al. 2008).

Despite the abovementioned advantages, laparoscopy should be considered to involve similar surgical risks to laparotomy such as anesthesia risks, infection, injury to intra-abdominal and pelvic organs, and bleeding. Unique risks are also associated with the laparoscopic approach. These risks include the risk of damage to organs and vasculature with laparoscopic port placement and intravascular carbon dioxide gas insufflation with use of pneumoperitoneum to perform surgery. The use of cautery or ultrasonic energy sources also introduces another element of risk to damage to intra-abdominal structures.

1.1 Ovarian Cysts

Ovarian cysts can occur at any stage in life from fetal life through menopause. They can be symptomatic or asymptomatic and found incidentally on clinical exam or on imaging.

The most common types of benign ovarian cysts that the gynecologist encounters include functional cysts (follicular, hemorrhagic, and corpus luteum cysts), mature cystic teratomas (dermoids), endometriomas, and serous and mucinous cystadenomas (Table 1).

1.2 Functional Cysts

Most ovarian cysts develop as a result of faulty ovulation where the follicle fails to release an oocyte. Gradually, a cyst forms because the follicular cells continue to secrete fluid and the fluid accumulates. The cysts are referred to as follicular cysts, and they often resolve spontaneously and do not require surgical intervention (Nelson and Gambone 2010).

Another type of functional cyst is a corpus luteum cyst. The actual mechanism of how the cyst forms is not well understood. This cyst can become quite large and cause symptoms, may be associated with a delay of menses, and is more apt to undergo torsion due to the increased size when compared to the follicular cyst.

Table 1 Classification and characteristics of benign ovarian cysts

Functional ovarian cysts	
Follicular cyst	Common in reproductive age women
Corpus luteum cyst	Common in reproductive age women; forms when the corpus luteum fails to regress, may be hemorrhagic
Benign cystic ovarian neoplasms	
Epithelial cell tumors	Derived from mesothelial cells lining the peritoneal cavity and ovary
	Examples: serous cystadenoma, mucinous cystadenoma, endometrioma
Germ cell tumors	Derived from germ cells: may contain ectoderm, mesoderm, or endoderm
	Cystic mature teratoma dermoid cyst
Sex cord-stromal tumors	Derived from sex cords and stroma of developing gonad; may cause feminizing/virilizing effects
	Examples: granulosa-theca cell tumor, Sertoli-Leydig cell tumor

(Beckmann et al. 2006; Nelson and Gambone 2010)

1.3 Benign Cystic Ovarian Neoplasms

These cysts are usually categorized due to the cell type of origin such as surface epithelium, germ cell, or sex cord-stromal cells. The majority of these cysts are benign. At least 30% of ovarian masses in women over the age of 50 are malignant (Kinkel et al. 2005). The risk of malignancy significantly increases in the postmenopausal woman with a cystic neoplasm (Beckmann et al. 2006).

Epithelial cell tumors are thought to develop from mesothelial cells that line the ovary and peritoneal cavity. Cystic epithelial tumors account for approximately 60% of all true ovarian neoplasms. The endometrioma, serous cystadenoma, and mucinous cystadenoma fall into this category.

Serous and mucinous cystadenomas are typically thin walled, unilocular, or multilocular and can range widely in size. Mucinous cystadenomas tend to be multilocular and much larger than serous cystadenomas. The peak incidence of serous and mucinous cystadenomas is in the fourth to fifth decade. One-third of all ovarian tumors are serous and two-thirds of those are benign. Mucinous epithelial tumors account for 10–15% of all epithelial neoplasms and 75% are benign (Goldberg 2015).

Serous tumors are bilateral 25% of the time, whereas mucinous tumors have a much lower incidence of bilaterality ranging 2–3% (ACOG 2007). The incidence of bilaterality should be taken into consideration and discussed with the patient at the time of evaluation, particularly if surgical management is required.

The origin of the endometrioma is controversial. Several investigators favor the theory that the endometrioma originates as invaginated endometrial glands on the surface of the ovary (Hughesdon 1957; PPe 1957; Nezhat et al. 1992; Brosens et al. 1994). The endometrioma tends to develop very slowly over time and tends to be moderate in size averaging 5–6 cm in size.

Endometriomas are hormonally active with the menstrual cycle. This often translates into exacerbation of symptoms just prior to and during menses for the patient. The endometrioma can also present a challenge in removal of the capsule to the surgeon. The capsules tend to be very adherent to adjacent ovarian tissue and often are only able to be partially removed which may increase risk of recurrence if ovarian conservation is desired.

Mature cystic teratomas (dermoid cysts) are also common benign cystic ovarian neoplasms. Dermoid cysts account for 10–20% of ovarian neoplasms and have an incidence of bilaterality of 8–14%. They are also the most common benign ovarian tumor in the second and third decade of life (Killackey and Neuwirth 1988). They are commonly composed of multiple cell types derived from one or more of the three germ cell layers (Hamilton 2015). They are almost always benign but can undergo malignant transformation in 0.2–2% of cases (Comerci et al. 1994; Hamilton 2015)

Historically, laparoscopic management of mature cystic teratomas was not pursued due to concerns regarding the risk of chemical peritonitis in the event of intraoperative spillage of the cyst's sebaceous contents. Recent evidence has not supported this concern. Nezhat et al. noted an incidence of 0.2% of chemical peritonitis with

review of 10 years of experience (Nezhat et al. 1999) It is now very feasible to remove a dermoid cyst via laparoscopic cystectomy.

Simple ovarian cysts up to 10 cm are likely to be benign at all ages with the incidence of malignancy <1% (Modesitt et al. 2003). There is little evidence in the literature to guide practitioners on which asymptomatic cysts may be ignored or followed. The decision to proceed with surgical interventions usually is usually based upon many factors and individualized for each patient. Cysts that continue to grow or become more symptomatic are more likely to undergo surgical treatment.

2 Workup

The vast majority of pelvic masses are benign in the premenopausal woman. The initial workup should include a medical history, physical exam, serial beta-HCG, CBC, and ultrasound imaging. Depending on the presentation, physicians may also elect to check serial hematocrits and cervical cultures if a hemorrhagic cyst or abscess is suspected. Many cysts can and should be managed expectantly if infection, pregnancy, or torsion have been excluded (ACOG 2007).

Cystic ovarian masses that are symptomatic with pain, pressure, or fever often require immediate intervention such as antibiotics for a tubo-ovarian abscess, medical or surgical management for an ectopic pregnancy, or surgical management for a suspected ovarian torsion.

The postmenopausal woman with a cystic adnexal mass requires a higher index of suspicion for malignancy. The initial workup in addition to a medical history and physical exam should include transvaginal ultrasound imaging and a CA 125 level. Ultrasound findings that raise suspicions for malignancy include solid areas in the mass, excrescences, and free fluid in the abdomen and/or pelvis. The ovary is also a common site of metastases for other primary cancers such as the breast, uterus, colorectal, or gastric cancers. The additional workup of the postmenopausal woman with a suspected malignancy or complex cystic mass should include breast exam, mammogram, digital rectal exam, endometrial biopsy, and upper and lower gastrointestinal endoscopy.

There is no single presurgical evaluation, blood test, and imaging modality that can definitively determine if an adnexal mass is benign or malignant. A definitive diagnosis of the adnexal mass can only be made with surgical excision and histologic evaluation. However, as previously mentioned, the vast majority of cystic adnexal masses are benign (Valentin et al. 2006). In addition, ultrasonographic findings associated with a simple ovarian cyst, endometrioma, or dermoid cysts are quite characteristic and highly predictive of histologic diagnosis.

Many studies support that a thorough preoperative workup will decrease the possibility of performing a laparoscopy in evaluation for a malignant mass (Whiteside and Keup 2009). If a malignancy is suspected, then a laparotomy is the initial proper surgical management. Unfortunately, a CA 125 level, pelvic ultrasound, or peritoneal cytology is not sufficient to rule out a suspected malignancy. Therefore, the decision often rests on the surgeon's intraoperative evaluation and judgment at the time of laparoscopy on whether to proceed with salpingo-oophorectomy and/or laparotomy for suspected malignancy.

2.1 Imaging

Pelvic ultrasound remains the preferred imaging modality to evaluate adnexal cysts.

A simple cyst appears as a round or oval anechoic space with smooth thin walls and no solid component or internal flow on Doppler (Levine et al. 2010). Color or Doppler flow is used to evaluate a complex cyst for internal flow in solid areas or septations. The principle with Doppler flow is that new vessels within tumors have lower resistance to blood flow because of no smooth muscle in the vessel walls (Helm 2015). At this time, the current role of color Doppler in evaluation of pelvic masses remains controversial because the ranges in the values of the resistive index, pulsatility index, and maximum systolic velocity between benign and malignant masses overlap considerably (ACOG 2007).

Complex cysts typically have ultrasound findings with more than one compartment, referred to as multilocular, thickened walls, papillary projections into the cyst itself or on the surface of the ovary, or abnormal-appearing areas inside the cyst. These findings can be associated with many benign neoplasms or malignant tumors of the ovary. Ultrasound is also helpful in differentiating from other adnexal masses such as hydrosalpinges, paraovarian or tubal cysts, or leiomyomata. Transvaginal, transabdominal, or both need to be utilized to fully evaluate the entire cystic structure. Transabdominal ultrasound imaging is better in evaluating large masses and other findings associated with them such as free fluid or ascites and hydronephrosis.

Other imaging modalities such as the CT, MRI, or PET are not routinely recommended in the initial workup for a cystic mass. The MRI, however, can be very useful in evaluating pelvic masses such as pedunculated leiomyomata or masses that are not adequately evaluated with ultrasound imaging. The CT is most useful in detecting metastatic disease when malignancy is suspected on initial workup.

2.2 Serum Markers

Serum markers are not useful as a routine screening test even though CA 125 levels are elevated in 85% of patient with epithelial ovarian carcinomas. The value is normal in 50% of patient with stage 1 cancers confined to the ovary and in 20–35% of advanced stage ovarian cancer cases (Jacobs and Bast 1989; ACOG 2011). CA 125 levels are also not very specific and are also elevated in patients with some benign conditions such as pregnancy, infection, menstruation, fibroids, endometriosis, cyst rupture, renal failure, and peritoneal inflammation.

Many other potential serum markers are undergoing current research. Their role in the detection of precancer or cancer of the ovary remains yet to be determined.

The presence of at least one of the following indicators warrants consideration of referral to or consultation with a gynecologic oncologist:

Postmenopausal women: elevated CA 125 level, ascites, a nodular or fixed pelvic mass, or evidence of abdominal or distant metastasis

Premenopausal women: very elevated CA 125 level, ascites, or evidence of abdominal or distant metastasis (ACOG 2011)

3 Management

3.1 Observation

Simple functional cysts have been traditionally managed with hormonal suppression with oral contraceptives. However, recent meta-analyses have demonstrated no difference between suppression with oral contraceptives and expectant management in terms of resolution of the ovarian cyst. In premenopausal women, 70% of adnexal masses will resolve over several menstrual cycles (Curtin 1994). As a result, it is now the standard of care to observe simple ovarian cysts up to 8 cm through several menstrual cycles and follow-up ultrasound imaging for resolution (Grimes et al. 2009). Oral contraceptives are no longer recommended for suppression to facilitate resolution of ovarian cysts (ACOG 2010). Observation is generally not recommended for ovarian cysts $\geq$8 cm due to increased risk of ovarian torsion.

Postmenopausal women with asymptomatic simple ovarian cysts and a normal CA 125 level may also be followed expectantly with serial ultrasound examinations. Some data supports that in this scenario, simple cysts up to 10 cm can also be followed and observed (Bailey et al. 1998). Close follow-up care is very important because the risk of a malignant ovarian neoplasm increases from 13% in premenopausal to 45% in postmenopausal patient (McDonald and Modesitt 2006).

3.2 Surgical Intervention

Persistent and/or symptomatic simple ovarian cysts >5–10 cm in size should be considered for surgical removal. Complex ovarian cysts should be considered for surgical removal in the

symptomatic premenopausal female. With the exception of simple ovarian cysts on a transvaginal ultrasound finding, most pelvic masses in postmenopausal women will require surgical intervention. The decision to intervene surgically may be complicated and involve many factors and should be individualized based on the clinical scenario and associated findings.

3.3 Laparoscopy

The use of laparoscopy is constantly expanding in gynecologic surgery. It has become the preferred surgical approach for the management of symptomatic or persistent benign ovarian cysts, depending on the experience and skill of the surgeon. This includes suspected endometriomas, hemorrhagic cysts, dermoids, functional cysts, or cystadenomas that have not resolved with expectant management or are symptomatic. Typically, endometriomas, dermoid cysts, or cystadenomas do not resolve spontaneously. Quite often, the diagnosis of a serous or mucinous cystadenoma is not made until laparoscopic evaluation and subsequent removal via cystectomy or oophorectomy.

3.4 Aspiration of Cyst

Aspiration of an ovarian cyst at the time of laparoscopy is generally not recommended unless it is used to facilitate a laparoscopic ovarian cystectomy. Even in the situation of cystectomy, this should only be carried out in an endoscopic bag to avoid spillage in the event of an unsuspected malignancy. If aspiration is solely used to manage an ovarian cyst, there is a high recurrence rate of the cyst approaching up to 65% (Mesogitis et al. 2005). In addition, there is no tissue for pathologic evaluation and malignancy cannot be ruled out. It has also not been proven more effective than expectant management (Zanetta et al. 1996).

Aspiration of ovarian cysts is contraindicated in postmenopausal women due to concerns regarding the increased potential for malignancy. Evidence shows that there is demonstrated decrease survival of stage 1 ovarian cancer patients if spillage occurs intraoperatively compared to patients with tumors removed intact (Cuesta et al. 1994; Mizuno et al. 2003).

3.5 Laparoscopic Ovarian Cystectomy

The optimal surgical goal is to remove the entire cyst intact. The cyst should be removed inside a laparoscopic bag so that inadvertent spillage into the peritoneal cavity may be avoided. If an oophorectomy is performed, the ovary with the intact cyst should be removed contained within an endoscopic bag.

Very large benign-appearing ovarian cysts are now being managed more commonly via the laparoscopic approach. In this approach, the ovary is usually placed in an endoscopic bag and drained of excess fluid and then removed within the bag through a small incision (Eltabbakh et al. 2008). This approach obviously avoids a large laparotomy incision and facilitates a faster recovery with decreased morbidity and cost for the patient.

Ovarian conservation is generally the goal in a premenopausal woman with a benign ovarian cyst requiring surgical excision. The advantage is preservation of viable ovarian tissue and thus fertility and hormone production. Oophorectomy and possibly bilateral salpingo-oophorectomy may be elected in surgical management of a postmenopausal woman with a benign cyst. Oophorectomy may also be considered for premenopausal women who are considered for increased genetic risk for ovarian cancer.

Entry into the abdomen may be performed with several techniques. In a Cochrane review of 46 randomized controlled trials comparing various techniques, there was no advantage of using any single technique in preventing vascular or visceral complications. There is insufficient evidence to recommend on laparoscopic entry technique over another (Ahmad et al. 2008).

An understanding of the anterior abdominal wall vessels is of paramount importance to avoid injury to these vessels. There are two sets of

bilateral vessels, the superficial and inferior epigastric vessels. The vessels are located an average of 5.5 cm from the midline. The lateral ports should be placed approximately 8 cm from the midline to avoid vascular injury. Transillumination of the anterior abdominal wall with the laparoscope to visualize the superficial vessels is recommended during placement of lateral ports. It is also optimal to try and visualize the inferior vessels intra-abdominally with visualization of the laparoscope whenever possible.

In patients with a history of prior abdominal surgery, there is a risk of 20% of adhesions to the anterior abdominal wall involving the omentum or bowel (Vilos et al. 2007). As a result, surgeons may elect to gain entry with any of the three following techniques: the closed entry with the Veress needle, open laparoscopy, or left upper quadrant placement at Palmer's site.

3.6 Standard Closed Entry

The Veress needle may be used to create a pneumoperitoneum prior to laparoscopic port placement. The needle is advanced into the peritoneal cavity usually through a 5 mm incision at the umbilicus. During placement of the Veress needle, the abdominal wall is elevated by using two perforating towel clamps placed just lateral to the umbilicus and lifting up during insertion or manually grasping and lifting the abdominal wall superior to the suprapubic area during insertion. The abdominal wall is elevated to maximize the distance between the abdominal wall and retroperitoneal vessels. Entry into the peritoneal cavity may be confirmed with the saline drop test and observation for pressure less than 8 mmHg during insufflation. The CO2 gas is then insufflated into the needle to create a pneumoperitoneum. Maximum insufflation pressure is usually set at 15 mm but can be increased to 20 mm if needed and tolerated by the patient. Once this pressure is obtained, then an adequate pneumoperitoneum is obtained, and the surgeon can now proceed with umbilical primary port placement.

Hurd et al. (1991) characterized the difference in abdominal wall thickness and how it can influence laparoscopic port entry. In women with ideal body weight (body mass index, [BMI] <25 kg/m^2), the Veress needle is inserted toward the hollow of the sacrum at a 45° Fig. 1a). The retroperitoneal vessels are much closer to the abdominal wall, and there may be as little as 4 cm between the skin and these vessels in thin patients. In the obese patient (BMI >30 kg/m^2), a more vertical approach, approximately 70–80°, is necessary to enter the peritoneal cavity because of increased thickness of the abdominal wall (Fig. 1c).

Open laparoscopy may also be performed to gain entry into the abdominal cavity. There is no evidence to support that overall open entry is superior or safer than the other entry techniques (Ahmad et al. 2015).

Surgeons may elect to gain entry via the left upper quadrant in the event that periumbilical adhesions are suspected, patient has a history of umbilical hernia, or there are failed attempts at entry via the umbilicus. With this technique, the Veress needle is advanced through a 5 mm incision at Palmer's point, which is at the midclavicular line just beneath the lower rib margin and pneumoperitoneum created with insufflation of CO2 gas. A 5 mm laparoscopic port is then advanced into the peritoneal cavity and confirmed with visualization with the laparoscope.

Direct laparoscopic port placement is considered safe without a pneumoperitoneum when done with disposable blunt trocars. It is also faster than the Veress needle technique and is not associated with insufflation-related injuries because proper placement is confirmed with visualization with the laparoscope prior to insufflation. This is performed while elevating the abdominal wall with perforating towel clamps or manually grasping the abdominal wall and elevating it. Elevation of the abdominal wall during trocar insertion maximizes the distance between the umbilicus and the retroperitoneal vessels. Elevation of the abdominal wall during trocar or Veress needle placement, however, does not necessarily guarantee visceral or blood vessel injury.

The initial laparoscopic port is usually placed at the umbilicus with a 5–12 mm port. The pelvis is carefully surveyed, and the ovarian cyst is

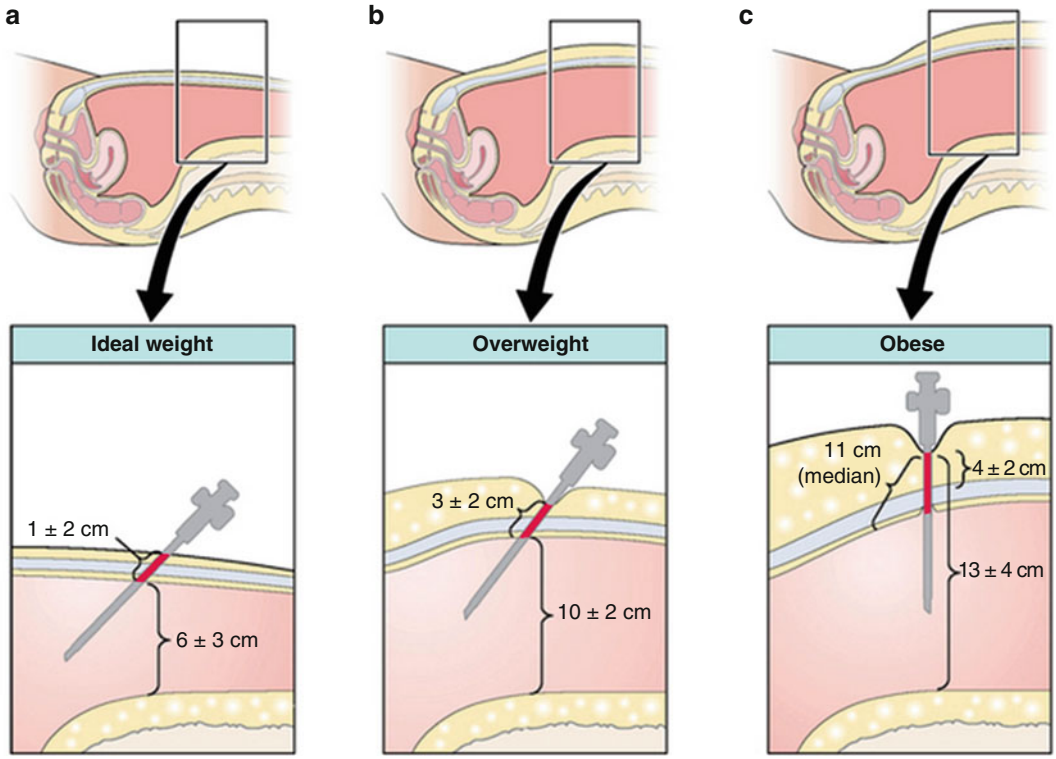

Fig. 1 Differences in umbilical trocar placement in patients with different BMIs (body mass index) (Adapted from Hurd et al. 1991)

examined for any signs that may be suggestive of malignancy such as ascites, excrescences on the surface of the ovary, and implants noted on peritoneal, liver, or diaphragm surfaces. Five millimeter ports are then placed laterally. The surgeon may opt to obtain cell washings at this time for cytology. If the cyst appears benign, then cystectomy is performed.

Cystectomy is then performed by incising the capsule of the ovary with endoshears or the surgeon's preferred laparoscopic power source. The cyst is then enucleated carefully with traction and countertraction and dissection as needed. If intraoperative rupture occurs, particularly with a dermoid cyst, the peritoneal cavity should liberally be rinsed with normal saline or Ringer's lactate that has been shown to be safe (Nezhat et al. 1999; Zanetta et al. 1999; Milingos et al. 2004).

After the cyst is removed from the ovary, an endoscopic bag is then advanced through the umbilical 10–12 mm port, and the cyst is placed in the bag. If a 5 mm umbilical port was used for initial survey, this port can be exchanged for a 10–12 mm port. The bag is then advanced up to the umbilical incision, and the port is removed while advancing the edges of the bag through the skin incision. The bag is then opened and triangulated to facilitate removal of the cyst intact if small enough or with morcellation carefully avoiding any spillage out of the bag. Prior to removal, the cyst may need to be drained while in the bag. Once the specimen is small enough, the bag is removed with the specimen through the incision. Other options for removing the specimen include a minilaparotomy or colpotomy. If colpotomy is performed, antibiotics are recommended.

If concern about the benign nature of the cyst exists, the cyst wall should be sent for frozen section at the time of removal. If malignancy is

confirmed or suspected, then the procedure should be converted to a laparotomy for continued appropriate surgical management.

After removal of the bag and specimen, the 10–12 mm laparoscopic port is replaced through the umbilical incision and the camera advanced through the port. The ovary is then carefully inspected for hemostasis. Bleeding from the bed of the cyst in the ovary may require measures to obtain hemostasis. Hemostasis in the bed of the ovary at the site of the cystectomy has traditionally been accomplished with bipolar cautery. This may also be performed with use of other laparoscopic power sources or application of a hemostatic agent. Recent evidence suggests that the application of hemostatic sealants such as FloSeal (Baxter International Inc., Deerfield, IL) or Surgicel fibrillar (Ethicon, Inc., Somerville, NJ) results in improved ovarian reserve after cystectomy compared to cautery (Song et al. 2014). The edges of the ovarian capsule do not need to be reapproximated as is traditionally done with an open ovarian cystectomy. Some surgeons prefer to utilize an adhesion barrier product on the ovary to minimize postoperative adhesion formation.

The procedure is completed by irrigation of the pelvis, and a careful survey of the pelvis for hemostasis with the intraperitoneal pressure decreased to 5 mmHg. The port sites are then inspected for hemostasis. After all port sites are inspected for hemostasis, the C02 peritoneum is then allowed to escape through the umbilical port. Care is taken to ensure that as much gas is expressed as possible to minimize postoperative discomfort for the patient and to avoid the bowel being pushed into the incision sites as residual gas escapes. The incisions are then closed with suture, Steri-Strips, or a skin adhesive. Fascial closure is recommended for ports 10 mm or greater in size prior to skin closure to prevent subsequent development of an incisional hernia (Tonouchi et al. 2004).

Simple cysts in postmenopausal women can also be removed laparoscopically since the vast majority is benign. However, salpingo-oophorectomy is generally considered the procedure of choice.

3.7 Contraindications to Laparoscopic Ovarian Cystectomy

Absolute contraindications to ovarian cystectomy continue to be controversial. The presence of a known malignancy has traditionally been considered an absolute contraindication. As expertise increases with laparoscopy, there is currently disagreement regarding this concept. The use of laparoscopy in the setting of surgical management of malignancy continues to develop and expand. Laparoscopic staging and management of ovarian cancer have been reported (Fauvet et al. 2005; Lecuru et al. 2006). However, there are reports in the literature that suggest that laparoscopy may increase the risk of port-site metastases and intraperitoneal spread of cancer cells (Morice et al. 2004; Nagersheth et al. 2004; Ramirez et al. 2004). Continued experience will further define the role of laparoscopy in the surgical management of ovarian malignancy.

Relative contraindications have also changed over the past 30 years since laparoscopy has improved with advances in surgical technique and equipment. Previously, obese patients or patients with a history of multiple abdominal surgeries or bowel obstructions were considered not to be candidates for the laparoscopic approach. Open laparoscopy, left upper quadrant access, and the use of trocars with optical access capabilities are now widely accepted techniques for such patients.

3.8 Oophorectomy

Indications for oophorectomy as the preferred procedure are noted in the Table 2 below (Valea and Mann 2015).

Oophorectomy and most commonly laparotomy are the procedures of choice rather than cystectomy in women with an ovarian mass that is suspicious for malignancy. Oophorectomy is the preferred management for any ovarian mass that requires surgical intervention in postmenopausal women regardless of the suspicion for malignancy.

Table 2 Summary of indications for oophorectomy

Benign ovarian neoplasms not amenable to treatment with cystectomy, enucleation, partial oophorectomy
Elective or risk-reducing salpingo-oophorectomy
Adnexal torsion with necrosis
Ovarian malignancy
Tubo-ovarian abscess unresponsive to antibiotics
Definitive treatment for endometriosis but must consider long term health risks
Gastrointestinal or other metastatic cancers
Male pseudohermaphrodites

Valea and Mann (2015)

Laparoscopic oophorectomy is usually performed as a salpingo-oophorectomy. The infundibulopelvic ligament and the ureter are carefully identified. The ureter is easily identified through the peritoneum in most patients. If the ureter is difficult to identify, the peritoneum must be opened and dissection carried out retroperitoneally to facilitate location of the ureter. The procedure is then carried out with ligation of the infundibular pelvic ligament, the utero-ovarian ligaments, and the fallopian tube next to the cornua of the uterus. This can be performed with a variety of techniques including bipolar electrocautery, ultrasonic cutting and coagulation devices (e.g., Harmonic scalpel), bipolar vessel-sealing devices (e.g., LigaSure, EnSeal, Gyrus-PK), loop technique, or stapling devices. The ovary and fallopian tube are then placed in an endobag and brought up to the umbilical port-site incision and removed in a similar technique to the cystectomy. Cyst fluid may be carefully aspirated from the cyst while enclosed in the bag to facilitate removal through the port-site incision with care taken to avoid any spillage into the peritoneal cavity. If malignancy is suspected, morcellation of the ovary is not recommended to preserve optimal pathologic evaluation. If the ovary cannot be removed via the bag through the laparoscopic port, then a larger incision is required for safe removal.

4 Conclusion

Laparoscopic ovarian cystectomy has now evolved to become the gold standard of surgical management of benign cystic ovarian masses in premenopausal women. The development of improved laparoscopic camera systems and instruments has enabled surgeons to evolve and continually improve their laparoscopic surgical techniques. In addition, the role of minimally invasive approaches continues to gain increased acceptance with gynecologic oncologists in the management of possible malignancies.

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